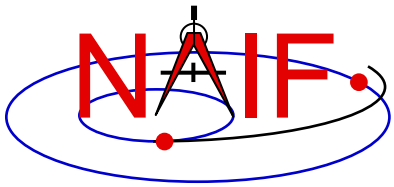


Navigation and Ancillary Information Facility

Porting Kernels

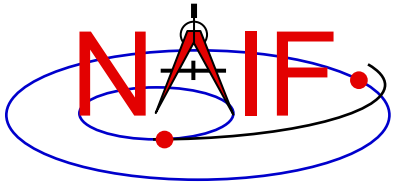
October 2022



Porting Issues - 1

Navigation and Ancillary Information Facility

- **Data formats vary across platforms, so data files created on platform “X” may not be usable on platform “Y.”**
 - **Binary formats:** different platforms use different bit patterns to represent numbers (and possibly characters).
 - **Text formats:** different platforms use different mechanisms to represent “lines” in text files.
 - Usually a “line terminator character sequence” indicates end-of-line.
- **We say two platforms have “compatible” binary or text formats if they use the same binary or text data representations.**
- **We say that a file is “native” if its format is the same as that of the computer you are using.**



Porting Issues - 2

Navigation and Ancillary Information Facility

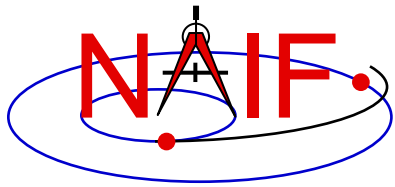
- Toolkit software can **usually** read kernels obtained from an incompatible platform
 - Binary SPK, CK, PCK and DSK kernels from one system can always be read on an incompatible system
 - Text kernels from one system can be read on an incompatible system only when using a C, IDL, MATLAB or JNI: not when using Fortran
- See later charts for compatibility matrix



Porting Issues - 3

Navigation and Ancillary Information Facility

- **When conversion to native format is required to make the kernel usable (see a later chart), several options are available.**
 - Use *bingo* for both binary and text kernels
 - Available only from the NAIF website; not provided in Toolkit packages
 - For text kernels, doing your file download using ftp in ASCII mode will perform the required format conversion on the fly
 - Web browsers often do text format conversion
 - However ASCII mode may not be available – sftp clients usually don't provide it. In such cases other tools such as freeware dos2unix and unix2dos, or bingo from the SPICE utilities page, must be used.
 - For binary kernels, the SPICE *toxfr* and *tobin* tools may be used to convert files to and from SPICE transfer format
 - This is an ASCII-based format that may be transferred in the same way as other ASCII files.



Compatible Environments for Text Kernels

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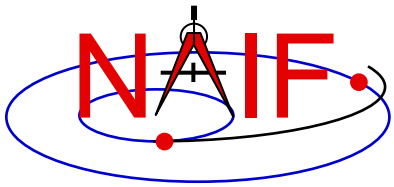
Since text kernels are only text files...

	<u>Groupings of Text Compatible Environments</u>	<u>End of line indicator</u>
1	PC using Windows or NT	<CR><LF>
2	Unix PC with LINUX Macintosh OSX (Motorola, Intel, or M1 chip)	<LF>

On a Unix/Linux/OSX box you can easily see what kind of line terminator is being used in a text file using the Unix “cat -et” command on your text file.

<CR> tokens will appear as “^M”

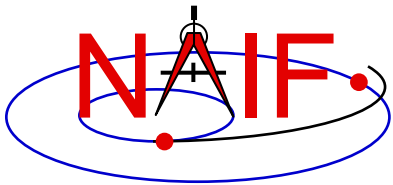
<LF> tokens will appear as “\$”



Compatible Environments for Binary Kernels

Navigation and Ancillary Information Facility

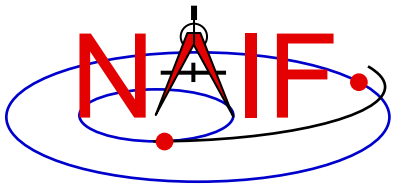
	<u>Groupings of Binary Compatible Environments</u>	<u>Binary Representation</u>
1	PC/ Windows PC/Linux Mac (Intel and M1 chip)	IEEE - Little endian
2	Sun Old Mac Power PC (Motorola chip, discontinued after 2005)	IEEE - Big endian



Caution Using Email

Navigation and Ancillary Information Facility

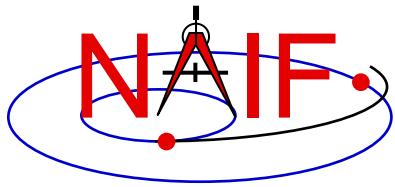
- **NAIF recommends against the use of email to transfer kernels unless previous tests have already proven successful using the same conditions/computers intended for current use. Possible causes of problems are:**
 - incompatible binary or text representations (as already discussed).
 - an attachment size limit somewhere in the e-mail chain.
 - the sender's or recipient's mail client modifies the kernel based on file name or presumed content.
- **When you must email kernels, compress them either with zip or gzip, then send the compressed file as an email attachment.**



Binary Kernels - Caveats

Navigation and Ancillary Information Facility

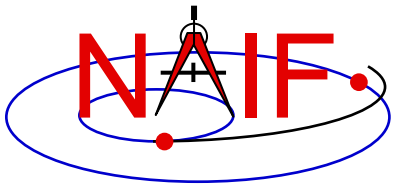
- If the kernel you are using is a non-native binary kernel you can read this file but you may not write data to this file.
 - You **can read** most non-native binary kernels using the automatic run-time conversion capability found in the APIs of modern Toolkits.
 - » Exception: non-native DAS-based files (ESQ) created before 2001 cannot be read. They must first be converted to native format.
 - You **cannot write** information into the comment area, or delete information from the comment area.
 - You **cannot append** additional data to the kernel.



Binary Kernels Allowed Operations

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- You may “load” and read both non-native and native binary kernels in the same runtime instance
- You may merge similar native and non-native files—the resultant, merged file will be in native format.
 - SPKs: using SPKMERGE or DAFCAT
 - CKs: using DAFCAT
 - DSKs: using DLACAT



Text Kernels - Caveats

Navigation and Ancillary Information Facility

- **Cutting/pasting complete, or pieces of, data assignments or `\begindata` or `\begintext` markers into a text kernel can cause a problem**
 - It may result in insertion of non-printing characters or incorrect end-of-line terminations
 - This is not a problem for comments, but it is probably best to treat all portions of a text kernel the same
- **If creating a text kernel by editing an existing one:**
 - first save a backup copy
 - be sure you are starting with a file in native format for the computer you are using: either Unix/Linux/Mac or Windows
 - be sure to insert a final end-of-line marker at the end of your last line of data or text
 - » Press “return”